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Knowledge-based 3D reconstruction compared to MRI for evaluation of right ventricular volumes and function in congenital heart diseases affecting the right ventricle

Olivier Guillard (1), Diala Khraiche (1), Magalie Ladouceur (1), Laurence Iserin (2), Francesca Raimondi (1), Damien Bonnet (1)

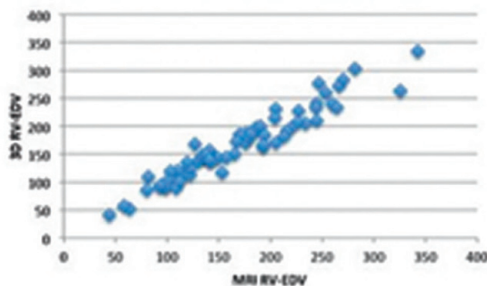
(1) CHU Hôpital Necker Enfants Malades-APHP, M3C, Paris, France – (2) CHU Hôpital Européen Georges Pompidou (HEGP) – APHP, Cardiologie, Paris, France

Background: Right ventricular (RV) volume and ejection fraction (RVEF) measurements are essential in the management of children with congenital heart disease. Cardiac Magnetic resonance imaging (MRI) is considered the reference method for RV volumes and RVEF measurements. Three-dimensional knowledge-based reconstruction (3D-KR) derived from two-dimensional echocardiographic imaging is a novel technique. The aim of this study was to assess the feasibility and reliability of this technique in children with diverse CHD involving the right ventricle.

Methods: 103 children (range age 0.1 to 18 years) referred for cardiac MRI, were included. Among them, 33 patients had barometric overload, 40 patients had volumetric overload, 18 patients had mixed overload, and 12 had Fontan circulation. Echocardiographic image acquisition was performed using a standard ultrasound probe linked to a Ventripoint Medical Systems unit. Parameters analysed were end-diastolic volume (EDV), end-systolic volume (ESV), and RVEF. The method of disk was used for CMR RV volumes. Intra-observer, inter-observer, and inter-technique variability was assessed using coefficients of variation (COV), and Bland-Altman analysis.

Results: Feasibility of 3D-KR was 100%. Echocardiographic RV volumes correlated well with CMR (EDV, $CC=0.96$; ESV, $ICC=0.93$; RVEF, $ICC=0.75$). For inter-observer analyses, COV were 8% for EDV, 15% for ESV, and 17% for EF. For intra-observer analyses, COV were 4% for EDV, 7% for ESV, and 9% for EF. The correlation of volumes and RVEF with MRI was slightly worse in the group with mixed overload compared with patients with volumetric or barometric overload. 3D-RVEF was overestimated compared with MRI whereas the volumes tend to be underestimated.

Conclusions: 3D-KR is feasible in children. It provides accurate and reproducible measurements of RV volumes. This new technique can be used as an accurate routine tool to assess RV function in CHD with pure barometric or volumetric overload.



Abstract 0241 – Figure: RV-EDV Right Ventricular End Diastolic Volume

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Assessment of aortic annulus diameter before trans-aortic valve implantation: impact of discordant sizing between transthoracic echocardiography and computed tomography on postprocedural regurgitation

Patrice Horen, Florent Le Ven, Thomas Hebert, Romain Didier, Philippe Castellant, Michel Nonent, Jacques Mansourati, Martine Gilard, Yannick Jobic
CHRU Brest La Cavale Blanche, Cardiologie, Brest, France

Aims: We sought to compare aortic annulus diameter measurements between trans-thoracic echocardiography (TTE) and multidetector computed

tomography (MDCT), and determine the impact of discordant sizing between these two techniques on post-procedural para-valvular regurgitation (PVR) among patients undergoing trans-aortic valve implantation with a balloon expandable valve.

Methods: A total of 136 consecutive patients underwent both TTE and MDCT for pre-operative assessment of aortic annulus (using mean diameter). Patients with significant renal impairment were excluded from the analysis. Prosthesis size was selected according to TTE measures. Discordant sizing referred to the situation where MDCT measures would have led to the implantation of a different size of prosthesis. We retrospectively analysed clinical and imaging data to determine variables associated with the occurrence of more than mild post-procedural PVR.

Results: Mean annulus diameters found by MDCT (CT-Mean-D) were larger than by TTE (TTE-D) (22.45 ± 1.95 mm vs. 21.33 ± 1.78 mm; $p < 0.001$). Discordant sizing was observed in 32 patients (23.5%), and a larger valve would have been implanted in 30 patients (22%) if we had referred to MDCT sizing alone. Incidence of post-procedural PVR was higher in patients with discordant than those with consistent sizing (25% vs. 9.6%; $p = 0.02$). In univariable logistic regression, the occurrence of post-procedural PVR was significantly associated with discordant sizing (OR=3.13; 95% CI: 1.12 to 8.80; $p = 0.03$), a higher difference between CT-Mean-D and TTE-D (OR=1.80; 95% CI: 1.22 to 2.66; $p = 0.003$ by millimeter increase) and a higher CT-Mean-D (OR=1.47; 95% CI: 1.10 to 1.99; $p = 0.006$ by millimeter increase).

Conclusion: Discordant sizing between TTE and MDCT is associated with more post-procedural PVR. Pre-procedural identification of these patients and reassessment with multimodality imaging may improve clinical outcomes.

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Left ventricular thrombus among patients with anterior myocardial infarction and low ejection fraction: incidence, diagnostic methods and evolution. A prospective multicenter study

Philippe Meurin (1), Virginie Brandao Carreira (2), Raphaëlle Dumaine (1), Alain Shqueir (3), Olivier Milleron (4), Benjamin Safar (5), Sergio Perna (6), Charles Smadja (7), Marc Genest (8), Jérôme Garot (9), Bernard Carrette (10), Jean Yves Tabet (1)

(1) Les Grands Prés, Cardiologie, Villeneuve Saint Denis, France – (2) Hôpital de Lagny Marne la Vallée, Cardiologie, Jossigny, France – (3) Cabinet de Cardiologie et Collège National des Cardiologues Français, Paris, France – (4) CHU Bichat-Claude Bernard-APHP, Cardiologie, Paris, France – (5) Hôpital de Montfermeil et CNCH, Cardiologie, Montfermeil, France – (6) Hôpital de Meaux, Cardiologie, Meaux, France – (7) Clinique de Tourman, Cardiologie, Tournan En Brie, France – (8) Hôpital Léon Binet, Cardiologie, Provins, France – (9) Institut Jacques Cartier, Massy, France – (10) Clinique de Courlancy, Cardiologie, Reims, France

Introduction: LV thrombi complicate 5-10% of unselected anterior myocardial infarction (Ant-MI). However, the incidence and the evolution of LV thrombi in a high risk population of patients with Ant-MI complicated with LV systolic dysfunction is not well known.

Cardiac magnetic resonance imaging with contrast delayed enhancement (CMR-DE) is nowadays considered the gold standard in assessment of LV thrombus but published comparison between transthoracic echocardiography (TTE) and CMR-DE are scarce.

Hypothesis: We assessed the hypothesis that LV thrombi are still frequent after a large Ant MI, and that a focused TTE has a good accuracy to detect them when compared to CMR-DE.

Methods: In 7 centers, we prospectively included patients having a left ventricular ejection fraction (LVEF) inferior to 45% at a first TTE performed less than 7 days after an Ant-MI. A second evaluation including TTE and CMR-DE (analyzed by blinded examiners) was performed at 30 days follow up. A third TTE assessment was performed between the sixth and the twelfth months.

Results: One hundred patients (men: 71%, mean age: 59.1 ± 12.1 years, LVEF: 33.5 ± 6.0 %), were consecutively included 4.8 \pm 1.9 days after an Ant-MI. Eighty eight of them (88%) had had a primary coronary angioplasty. Among them, 26 LV thrombi were detected. When compared with CMR-DE, TTEE sensibility and specificity were 94.7% and 98.5% respectively. Twenty four (92.3%) of the LV thrombi disappeared under triple antithrombotic